

PTO 2001-3954

German  
Document No. 19,756,454

USE OF GLYCERIN CARBONATE  
[Verwendung von Glycerincarbonat]

Joerg Kahre, Thorsten Loehl, Holger Tesmann, and Hermann Hensen

UNITED STATES PATENT AND TRADEMARK OFFICE  
Washington, D.C. September 2001

Translated by: Schreiber Translations, Inc.

Country : Germany

Document No. : 19,756,454

Document Type : Patent specification (first  
publication)

Language : German

Inventor : Joerg Kahre, Thorsten Loehl, Holger  
Tessmann, and Hermann Hensen

Applicant : Henkel KGeA, Duesseldorf, Germany

IPC : B01F 17/00, B01F 17/32, C09D 7/02,  
C09K 3/16, C07D 317/36

Application Date : 18 December 1997

Publication Date : 17 June 1999

Foreign Language Title : Verwendung von Glycerincarbonat

English Title : **USE OF GLYCERIN CARBONATE**

## Use of Glycerin Carbonate

The use of glycerin carbonate as emulsifier for producing surfactant preparations is proposed. Glycerin carbonate allows the stable incorporation of active ingredients which are otherwise difficult to emulsify into cosmetic products and has also enhancing properties.

## Description

The invention relates to the field of cosmetics and concerns the use of glycerin carbonate as an emulsifier, as substitute substance for silicon oils, as well as an enhancing product.

## State of the Art

From the state of the art are known many compounds, which have emulsifying properties; especially important are non-ionic tensides, such as, for example, fatty alcohol polyglycol ethers. With the increased demand for economic "smart" cosmetic raw products, there is a higher need for substances, which do not have emulsifying properties, but which can take on different tasks in the final formulations. The goal is, therefore, to reduce in this way the number of individual components to be able to produce the preparations with less technical effort and at

---

<sup>1</sup> Numbers in the margin indicate pagination in the foreign text.

lower cost. There is a particular interest in emulsifiers, which also allow the stable incorporation of active ingredients which are otherwise difficult to emulsify, and which at the same time substitute or partially substitute the silicon oils in the cosmetic preparations, that is, they have sufficient enhancing and antistatic properties. The object of the invention is therefore to make available these "multifunctional compounds."

#### Description of the Invention

The object of the invention is the use of glycerin carbonate as emulsifier to produce surfactant preparations such as, for example, cosmetic products, shampoos, rinses, and cleansers, enhancing products, as well as lacquers and paints.

It was surprisingly found that glycerin carbonate has excellent emulsifying properties and that it also allows to incorporate active ingredients, which are otherwise difficult to emulsify, in a stable manner and without producing opacity into formulations. Another advantage consists in that glycerin carbonate represents a multifunctional compound, that is, aside from its emulsifying properties, glycerin carbonate is also interesting above all for the production of cosmetic preparations, since it unexpectedly also improves the combining of dry hair, especially in long hair, and in this sense even exceeds the results obtained with the known commercial silicon oils.

## Glycerin Carbonate

Glycerin carbonate is produced, as a rule, by transesterification of dimethyl carbonate or diethyl carbonate with glycerin. The fraction of glycerin carbonate in the surfactants can be from 1 to 50, preferably from 5 to 30, and especially from 10 to 25 weight percent.

## Tensides

The glycerin carbonate can be used in the surfactants together with anionic, non-ionic, cationic, as well as amphoteric or zwitterionic tensides. Typical examples of anionic tensides are soaps, alkylbenzol sulfonates, alkane sulfonates, olefin sulfonates, alkylether sulfonates, glycerinether sulfonates,  $\alpha$ -methylester sulfonates, sulfo fatty acids, alkyl sulfates, fatty alcohols ether sulfates, hydroxy mix ether sulfates, monoglyceride(ether) sulfates, fatty acid amide(ether) sulfates, monoalkyl and dialkyl sulfosuccinate, monoalkyl and dialkyl sulfosuccinates, sulfotriglycerides, amide soaps, ether carbonic acids and their salts, fatty acid isothianates, fatty acid sarcosinates, fatty acid taurides, N-acyl amino acids such as, for example, acyl lactates, acyl tartrates, acyl glutamates, and acyl aspartates, alkyl oligoglucoside sulfates, protein fatty acid condensates (especially plant products on wheat base), and alkyl(ether) phosphates. Insofar as the anionic tensides contain polyglycol ether chains, they can have a conventional, preferably

however a condensed homologous distribution. Typical examples of non-ionic tensides are fatty alcohol polyglycol ethers, alkylphenylene polyglycol ethers, fatty acid polyglycol esters, alkylphenol polyglycol ether, fatty acid polyglycol ethers, fatty amide polyglycol ethers, fatty amine polyglycol ether, alkylphenol polyglycol ether, fatty acid polyglycol ether, fatty acid amide polyglycol ether, fatty amine polyglycol ether, alkoxyated triglycerides, mixed ethers or mixed formals, if necessary partially oxidated alk(on)yl oligoglycosides or glucuronic acid derivatives, fatty acid N-alkyl glucamides, protein hydrolyzates (especially plant products on a wheat basis), polyol fatty acid esters, sugar esters, sorbitan esters, polysorbates, and amino oxides. Insofar as the non-ionic tensides contain polyglycol ether chains, they can have conventional, preferably however a concentrated homologous distribution. Typical examples of cationic tensides are quaternary ammonium compounds and esterquats, especially quaternary fatty acid trialkanol aminoester salts. Typical examples of amphoteric or zwitterionic tensides are alkyl betaines, alkyl amidobetaines, aminopropionates, aminoglycinates, imidazolinium betaines, and sulfobetaines. The mentioned tensides are all known compounds. With respect to the structure and production of these substances it is referred to the enclosed general review publications, for example, J. Falbe (ed.),

"Surfactants in Consumer Products," Springer Publishers, Berlin, 1987, p. 54, 124 or J. Falbe (ed.) "Catalyzers, Tensides, and Mineral Oil Additives," Thieme Publishers, Stuttgart, 1978, p. 123, 217. The glycerin carbonate is preferably used together with alkyl ether sulfates and/or alkyl and/or alkenyl oligoglycosides. The weight ratio of glycerin carbonate to the tensides can be 99:1 to 1:99, especially 90:10 to 10:90, preferably 75:25 to 25:75, and particularly preferred 60:40 to 40:60. The fraction of tensides in the products can lie in the range of 1 to 50, preferably 5 to 30, and especially 15 to 25 weight percent.

/3

#### Oily Bodies

The glycerin carbonate can be used together with oily bodies for producing surfactants, especially considered are cosmetic preparations with 6 to 18, preferably 8 to 10 carbon atoms, esters of linear C<sub>6</sub>-C<sub>22</sub> fatty acids with linear C<sub>6</sub>-C<sub>22</sub> fatty alcohols, esters of branched C<sub>6</sub>-C<sub>13</sub> carbonic acids with linear C<sub>6</sub>-C<sub>22</sub> fatty alcohols, esters of linear C<sub>6</sub>-C<sub>22</sub> fatty acids with polyvalent alcohols (such as, for example, propylene glycol, dimerdiol, or trimertriol) and/or guerbet alcohols, triglycerides on a basis of C<sub>6</sub>-C<sub>10</sub> fatty acids, fluid mono/di/triglyceride mixtures on a basis of C<sub>6</sub>-C<sub>18</sub> fatty acids, esters of C<sub>2</sub>-C<sub>12</sub> dicarbonic acids with linear or branched alcohols with 1 to 22

carbon atoms or polyols with 2 to 10 carbon atoms and 2 to 6 hydroxyl groups, vegetable oils, branched primary alcohols, substituted cyclohexanes, linear C<sub>6</sub>-C<sub>22</sub> fatty alcohol carbonates, guerbet carbonates, esters of benzoic acid with linear and/or branched C<sub>6</sub>-C<sub>22</sub> alcohols (for example, Pinsolv® TN), dialkyl ethers, ring opening products of epoxidized fatty acid esters with polyols, silicon oils, and/or aliphatic or naphthenic hydrocarbons. The fraction of oily bodies in the surfactants can be from 5 to 85, preferably 10 to 70, and particularly 15 to 50 weight percent.

#### Co-Emulsifiers

The glycerin carbonate can be used together with co-emulsifiers. Considered therefore are, for example, non-ionogenic tensides of at least one of the following groups:

- (a1) addition products of 2 to 30 mol ethylene oxide and/or 0 to 5 mol propylene oxide on linear fatty alcohols with 8 to 22 C atoms, on fatty acids with 12 to 22 C atoms, and an alkyl phenol with 8 to 15 C atoms in the alkyl group;
- (a2) C<sub>12/18</sub> fatty acid monoesters and diesters of addition products of 1 to 30 mol ethylene oxide on glycerin;
- (a3) glycerin monoesters and diesters and sorbitan monoesters and diesters of saturated and unsaturated fatty acids with 6 to 22 carbon atoms and their ethylene oxide addition products;



- (a4) alkyl monoglycosides and oligoglycosides with 8 to 22 carbon atoms in the alkyl residue and their ethoxylated analogs;
- (a5) addition products of 15 to 60 mol ethylene oxide on ricinus oil and/or hardened ricinus oil;
- (a6) polyol and especially polyglycerin esters such as, for example, polyglycerin polyricinoleate, polyglycerin poly-12-hydroxy stearate or polyglycerin dimerate. Also suitable are mixtures of compounds of several of these substance classes;
- (a7) addition products of 2 to 15 mol ethylene oxide on ricinus oil and/or hardened ricinus oil;
- (a8) Partial ester on a basis of linear, branched, unsaturated, or saturated C<sub>6/22</sub> fatty acids, ricinus acid as well as 12-hydroxy stearic acid and glycerin, polyglycerin, pentaerythrite, dipentaerythrite, sugar alcohols (for example, sorbit), alkyl glucosides (for example, methyl glucoside, butyl glucoside, lauryl glucoside) as well as polyglucosides (for example, cellulose);
- (a9) monoalkyl, dialkyl, and trialkyl phosphates as well as mono, di, and/or tri-PEG alkyl phosphates;
- (a10) wool wax alcohols;
- (a11) polysiloxane polyalkyl polyether copolymers or corresponding derivatives;

(a12) mixed ethers of pentaerythrite, fatty acids, citric acid, and fatty alcohol according to German patent publication 1,165,574 and/or mixed esters of fatty acids with 6 to 22 carbon atoms, methyl glucose, and polyolene, preferably glycerin as well as  
(a13) polyalkylene glycols.

The addition products of ethylene oxide and/or propylene oxide on fatty alcohols, fatty acids, alkyl phenols, glycerin mono and diester as well as sorbitan mono and diester of fatty acids or on ricinus oil represent known products which can be obtained on the market. They are homologous mixtures whose average alkoxylation degree corresponds to the ratio of substance quantities of ethylene oxide and/or propylene oxide and substrate with which the addition reaction is carried out.  $C_{12/18}$  fatty acid mono and diesters of addition products of ethylene oxide on glycerin are known from German patent publication 2,024,051 as lubrication products for cosmetic preparations.

$C_{8/18}$  alkyl mono and oligoglucosides, their production, and their use are known from the state of the art. Their production takes place especially by conversion of glucose or oligosaccharides with primary alcohols with 8 to 18 C atoms. With respect to the glucoside residue it applies that the monoglucosides, wherein a cyclic sugar residue is glucosidically bonded to the fatty alcohol, as well as also oligomeric

glucosides with one oligomerization degree up to preferably about 8 are suitable. The oligomerization degree is therein a statistically average value, which is based on the homologous distribution usual for these technical products.

Furthermore, zwitterionic tensides can also be used as emulsifiers. As zwitterionic tensides are designated those surfactant compounds, which carry in the molecule at least one quaternary ammonium group and at least one carboxylate and one sulfonate group. Especially suitable zwitterionic tensides are the so-called betaines such as N-alkyl-N,N-dimethyl ammonium glycinate, for example, the cocoalkyl dimethyl ammonium glycinate, N-acylamino propyl-N,N-dimethyl ammonium glycinate, for example, the cocoalkyl aminopropyl dimethyl ammonium glycinate, N-acylamino-propyl-N,N-dimethyl ammonium glycinate, for example, the cocoacyl amino propyl dimethyl ammonium glycinate, and 2-alkyl-3-carboxyl methyl-3-hydroxyethyl imidazolene with 8 to 18 C atoms in the alkyl or acyl group as well as cocoacyl aminoethyl hydroxyethyl carboxy methyl glycinate. Particularly preferred is the fatty acid derivative known under the CTFA designation of cocamidopropyl betaine. Also suitable emulsifiers are ampholytic tensides. Under ampholytic tensides are understood those surfactant compounds

/4

which contain at least one  $\text{-COOH}$  or  $\text{-SO}_3\text{H}$  group aside from a  $\text{C}_{8/18}$  alkyl or acyl group in the molecule and are able to form inner salts. Examples of suitable ampholytic tensides are N-alkyl glycines, -alkyl propionic acids, N-alkyl aminobutyric acids, N-alkyl iminodipropionic acids, N-hydroxyethyl-N-alkylamidopropyl glycines, -alkyl taurines, -alkyl sarcosines, 2-alkyl aminopropionic acids, and alkyl aminoacetic acids with about 8 to 18 C atoms in the alkyl group. Particularly preferred ampholytic tensides are the N-cocoalkyl aminopropionate, the cocoacyl aminoethyl aminopropionate and the  $\text{C}_{12/18}$  acyl sarcosine. Aside from ampholytic are considered also quaternary emulsifiers, wherein those of the type of the esterquats, preferably methyl-quaternary difatty acid triethanol aminoester salts are particularly preferred. The fraction of co-emulsifiers in the surfactants can be 1 to 25, preferably 3 to 15, and especially 5 to 10 weight percent.

#### Active Ingredients

A particular advantage of the glycerin carbonate used according to the invention consists in that its active ingredients, which are otherwise very difficult to emulsify, can be incorporated in a stable manner and without causing opacity into the formulations. Under suitable biogenic active ingredients are understood, for example, tocopherol, tocopherol acetate, tocopherol palmitate, ascorbic acid, desoxyribonucleic

acid, retinol, bisalcohol, allantoin, phytantriol, panthenol, AHA acids, amino acids, ceramides, pseudoceramides, essential oils, plant extracts, and vitamin complexes. As anti-dandruff products can be used octopirox and zinc pyrothione and especially climbazole. The fraction of active ingredient in the surfactants can be 0.1 to 5, preferably 0.5 to 3, and especially 1 to 2 weight percent.

#### Brightening Waxes

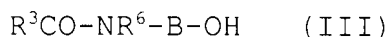
The glycerin carbonate is also suitable especially as an emulsifier for brightening waxes, especially together with alkyl glucosides and silicon oils. As brightening waxes are considered especially: alkylene glycol esters, fatty acid alcohol amides, partial glycerides, esters of polyvalent, if necessary hydroxy-substituted, carbonic acids with fatty alcohols with 6 to 22 carbon atoms, fatty substances such as, for example, fatty alcohols, fatty ketones, fatty aldehydes, fatty ethers, and fatty carbonates, which have in sum at least 24 carbon atoms, fatty acids, ring opening products of olefin epoxides with 12 to 22 carbon atoms with fatty alcohols with 12 to 22 carbon atoms and/or polyols with 2 to 15 carbon atoms and 2 to 10 hydroxyl groups, as well as their mixtures.

- Alkylene Glycol Esters. The alkylene glycol esters are usually mono and/or diesters of alkylene glycols, which follow the formula (II)



wherein  $R^3CO$  stands for a linear or branched, saturated or unsaturated acyl residue with 6 to 22 carbon atoms,  $R^4$  stands for hydrogen or  $R^3CO$ , and A stands for a linear or branched alkylene residue with 2 to 4 carbon atoms and n stands for numbers from 1 to 5. Typical examples are mono and diesters of ethylene glycol, propylene glycol, diethylene glycol, dipropylene glycol, triethylene glycol, or tetraethylene glycol with fatty acids with 6 to 22, preferably 12 to 18 carbon atoms, such as: caproic acid, caprylic acid, 2-ethyl hexanic acid, capric acid, lauric acid, isotridecanic acid, myristic acid, palmitic acid, palmoleic acid, stearic acid, isostearic acid, oleic acid, elaidic acid, petroselic acid, linoleic acid, linolenic acid, elaeostearic acid, arachic acid, gadoleic acid, behenic acid, and erucic acid, as well as their technical mixtures. Particularly preferred is the use of ethylene glycol mono and/or distearate.

Fatty acid alkanol amides, fatty acid alkanol amides, which are considered as brightening waxes, follow the formula (III),



wherein  $R^3CO$  stands for a linear or branched, saturated or unsaturated acyl residue with 6 to 22 carbon atoms,  $R^6$

stands for hydrogen or an, if necessary hydroxy-substituted alkyl residue with 1 to 4 carbon atoms, and B stands for a linear or branched alkylene group with 1 to 4 carbon atoms. Typical examples are condensation products of ethanolamine, methyl ethanolamine, diethyl ethanolamine, propanolamine, methyl propanolamine, and dipropanolamine, as well as their mixtures with caproic acid, caprylic acid, 2-ethyl hexanic acid, capric acid, lauric acid, isotridecanic acid, myristic acid, palmitic acid, palmoleic acid, stearic acid, isostearic acid, oleic acid, elaidic acid, petroselic acid, linoleic acid, linolenic acid, elaeostearic acid, arachic acid, gadoleic acid, behenic acid, and erucic acid, as well as their mixtures. Particularly preferred is the use of stearic acid ethanolamide.

- Partial glycerides. Partial glycerides which have brightening properties represent mono and/or diesters of the glycerin with fatty acids, namely, for example, caproic acid, caprylic acid, 2-ethyl hexanic acid, capric acid, lauric acid, isotridecanic acid, myristic acid, palmitic acid, palmoleic acid, stearic acid, isostearic acid, oleic acid, elaidic acid, petroselic acid, linoleic acid, linolenic acid, elaeostearic acid, arachic acid, gadoleic acid, behenic acid, and erucic acid, as well as their technical mixtures. The follow formula (IV)



wherein  $\text{R}^7\text{CO}$  for a linear or branched acyl residue with 6 to 22 carbon atoms,  $\text{R}^3$  and  $\text{R}^9$  independently from each other stand for hydrogen or  $\text{R}^7\text{CO}$ ,  $x$ ,  $y$ , and  $z$  in sum stand for 0 or numbers from 1 to 30 and  $X$  stands for an alkali or earth alkali metal, with the provision that at least one of the two residues  $\text{R}^8$  and  $\text{R}^9$  represent hydrogen. Typical examples are lauric acid monoglyceride, lauric acid diglyceride, cocofatty acid monoglyceride, cocofatty triglyceride, palmitic acid monoglyceride, palmitic acid triglyceride, stearic acid monoglyceride, stearic acid diglyceride, isostearic acid monoglyceride, isostearic acid diglyceride, oleic acid monoglyceride, oleic acid, diglyceride, tallow fatty acid monoglyceride, tallow fatty acid diglyceride, behenic acid monoglyceride, behenic acid diglyceride, erucic acid monoglyceride, erucic acid diglyceride, as well as their technical mixtures, which can have additional small quantities of triglycerides from the production.

- Polyvalent Carbonic Acid and Hydroxy Carbonic Acid Esters.  
As brightening waxes are taken into consideration esters of polyvalent, if necessary hydro-substituted, carbonic acids



with fatty alcohols with 6 to 22 carbon atoms. As brightening waxes are taken into consideration further esters of polyvalent, if necessary hydro-substituted, carbonic acids with fatty alcohols with 6 to 22 carbon atoms. As acid component of these esters are considered, for example, malonic acid, maleic acid, fumaric acid, adipic acid, sebacic acid, azelaic acid, dodecanic acid, phthalic acid, isophthalic acid, and especially succinic acid as well as malic acid, citric acid, and especially vinic acid and their mixtures. The fatty alcohols contain 6 to 22, preferably 12 to 18 and especially 16 to 18 carbon atoms in the alkyl chain. Typical examples are caproic alcohol, capryl alcohol, 2-ethylhexyl alcohol, caprin alcohol, laryl alcohol, isotridecyl alcohol, myristyl alcohol, cetyl alcohol, palmoleyl alcohol, stearyl alcohol, isostearyl alcohol, oleyl alcohol, elaidyl alcohol, petroselinyl alcohol, linolyl alcohol, linolenyl alcohol, elaeostearyl alcohol, arachyl alcohol, gadoleyl alcohol, behenyl alcohol, erucyl alcohol, and brassidyl alcohol, as well as their technical mixtures. The esters can be available as full or partial esters, for example, mono and above all diesters of the carbonic or hydroxycarbonic acids are used. Typical examples are succinic acid mono and dilauryl esters, succinic acid mono and distearyl, succinic acid mono and

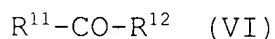
distearyl esters, vinic acid mono and dilauryl ester, vinic acid mono and dicoco alkyl ester, vinic acid mono and distearyl ester, citric acid monolauryl, dilauryl, and trilauryl ester, citric acid monococoalkyl ester, dicocoalkyl ester, and tricocoalkyl ester, as well as citric acid monocetearly ester, dicetearyl ester, and tricetaryl ester.

- Fatty Alcohols. As further groups of brightening waxes can be used long-chain fatty alcohols, which follow the formula (V)



wherein  $R^{10}$  stands for a linear alkyl residue with 24 to 48, preferably 32 to 36 carbon atoms. The mentioned substances are, as a rule, oxidation products of long-chain paraffins.

- Fatty Ketones. The fatty ketones, which are taken into consideration as components (a), follow preferably the formula (VI),



wherein  $R^{11}$  and  $R^{12}$  stand independently from each other for alkyl and/or alkylene residues with 1 to 22 carbon atoms, with the provision that they have at least 24 in sum, and preferably have 32 to 48 carbon atoms. The ketones can be produced according to the process of the state of the art, for example, by pyrolysis of the corresponding fatty acid

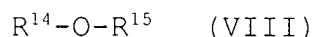
magnesium salt. The ketones can be structured symmetrical or asymmetrical, the two residues  $R^{11}$  and  $R^{12}$ , however, differ preferably only by one carbon atom and are derived from fatty acids with 16 to 22 carbon atoms. The stearone has been shown to have particularly advantageous brightening properties.

- Fatty Aldehydes. As brightening waxes are suitable fatty aldehydes corresponding to the formula (VII),



wherein  $R^{13}CO$  stands for a linear or branched acyl residue with 24 to 48, preferably 28 to 32 carbon atoms.

Fatty ethers. As brightening waxes can further be considered the fatty ethers having formula (VIII).



wherein  $R^{14}$  and  $R^{15}$  stand independently from each other for alkyl and/or alkenyl residues with 1 to 22 carbon atoms, with the provision that they have in sum they at least 24 and preferably 32 to 48 carbon atoms. The fatty ethers of the mentioned kind are usually produced by acid condensation of the corresponding fatty alcohols. The fatty ethers with particularly advantageous brightening properties are obtained by condensation of fatty acids with 16 to 22 carbon atoms such as, for example, cetyl alcohol, cetearyl alcohol,

stearyl alcohol, isostearyl alcohol, oleyl alcohol, behenyl alcohol, and/or erucyl alcohol.

- Fatty Carbonates. As brightening waxes are considered further fatty carbonates having the formula (IX)

/6

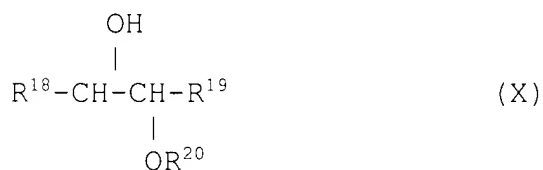


wherein  $R^{16}$  and  $R^{17}$  independently from each other stand for alkyl and/or alkenyl residues with 1 to 22 carbon atoms, with the provision that they have in sum at least 24 and preferably 32 to 48 carbon atoms. The substances are obtained in that, for example, dimethyl or diethyl carbonate are transesterified with the corresponding fatty alcohols in a manner known per se. As a consequence, the fatty carbonates can be structured symmetrically or asymmetrically. Preferably, however, carbonates are used wherein  $R^{16}$  and  $R^{18}$  are identical and which stand for alkyl residues with 16 to 22 carbon atoms. Particularly preferred are transesterized products of dimethyl or diethyl carbonate with cetyl alcohol, cetearyl alcohol, stearyl alcohol, isostearyl alcohol, oleyl alcohol, behenyl alcohol and/or erucyl alcohol in the form of their mono and diesters or their technical mixtures.

- Fatty Acids. For this purpose can be used aliphatic, if necessary hydroxy-substituted, carbonic acids with 16 to 22

carbon atoms such as, for example, stearic acid, cerylstearic acid, hydroxystearic acid, and behenic acid as well as their technical mixtures.

- Epoxy Ring Opening Products. The epoxy ring opening products are known products, which are usually produced by acid-catalyzed conversion of end-standing or inner-standing olefin epoxides with aliphatic alcohols. The reaction products preferably follow the formula (X),



wherein  $\text{R}^{18}$  and  $\text{R}^{19}$  stand for hydrogen or an alkyl residue with 10 to 20 carbon atoms, with the provision that the sum of the carbon atoms of  $\text{R}^{18}$  and  $\text{R}^{19}$  lies in the range from 10 to 20, and  $\text{R}^{20}$  stands for an alkyl and/or alkenyl residue with 12 to 22 carbon atoms and/or the residue of a polyol with 2 to 15 carbon atoms and 2 to 10 hydroxyl groups.

Typical examples are ring opening products of  $\alpha$ -dodecenepoxide,  $\alpha$ -hexadecenepoxide,  $\alpha$ -octadecenepoxide,  $\alpha$ -eucosenepoxide,  $\alpha$ -docosenepoxide, i-dodecenepoxide, i-hexadecenepoxide, i-octadecenepoxide, i-eicosenepoxide, and/or i-dodecosenepoxide with lauryl alcohol, cocofatty alcohol, myristyl alcohol, cetyl alcohol, cetearyl alcohol, stearyl alcohol, isostearyl alcohol, oleyl alcohol, elaidyl

alcohol, peroselinyl alcohol, linoyl alcohol, linoleyl alcohol, behenyl alcohol, and/or erucyl alcohol. Ring opening products of hexa and/or octadecenepoxides are used with fatty alcohols with 15 to 18 carbon atoms. If instead of fatty alcohols are used polyols for the ring opening, then these are the following substances: glycerin; alkylene glycols such as, for example, ethylene glycol, diethylene glycol, propylene glycol, butylene glycol, hexylene glycol, as well as polyethylene glycols with an average molecular weight of 100 to 1,000 Dalton; technical oligoglycerin mixtures with an autocondensation degree of 1.5 to 10 such as technical diglycerin mixtures with a diglycerin content of 40 to 50 weight percent; methylol compounds such as, for example, trimethylol ethane; trimethylol propane, trimethylol butane, pentaerythrite, and dipentaerythrite; low alkyl glucosides, especially those with 1 to 8 carbon atoms in the alkyl residue such as, for example, methyl and butyl glucoside; sugar alcohols with 5 to 12 carbon atoms such as, for example, sorbit or mannit, sugars with 5 to 12 carbon atoms such as, for example, glucose or saccharose; amino sugars such as, for example, glucamine.

The portion of brightening waxes in the surfactants can amount to, in the case of brightening concentrates, 5 to 50 and preferably 10 to 35 weight percent. In the case of end products

such as brightening shampoos, the concentration is lower, namely at 0.5 to 5 and preferably 1 to 2 weight percent.

#### Commercial Applications

Glycerin carbonate has excellent enhancing and antistatic properties and exceeds even the known silicon compounds currently on the market. Two other objects of the invention concern therefore its use as substitute for silicon oils in cosmetic and/or pharmaceutical preparations as well as enhancing means for producing cosmetic preparations in which it can be contained in quantities of 1 to 50, preferably 3 to 30, and especially 5 to 25 weight percent.

#### Surfactant Preparations

The preparations are preferably cosmetic products such as, for example, hair shampoos, hair lotions, foam baths, cremes, or lotions which can also contain auxiliary substances and additives, lubricants, stabilizers, consistency givers, thickeners, cation polymers, silicon compounds, film builders, preservatives, hydrotropes, solubilizers, UV-light filters, insect repellents, self-tanning products, perfumes, dyes, and the like.

As lubricants can be used substances such as, for example, lanolin and lecithin, as well as polyethoxylated or acylated lanolin and lecithin derivatives, polyol fatty acid esters, and fatty acid alkanolamides, wherein the latter also serve at the

same time as foam stabilizers. As consistency givers are taken into consideration above all fatty alcohols with 12 to 22 and preferably 16 to 18 carbon atoms and aside from that partial glycerides. Preferred

17

is a combination of these substances with alkyl oligoglucosides and/or fatty acid N-methyl glucamides of the same chain length and/or polyglycerin poly-12-hydroxystearates. Suitable thickening means are, for example, polysaccharides, especially xanthum gum, guar-guar, agar-agar, alginates, and tyloses, carboxymethyl cellulose and hydroxyethyl cellulose, also higher molecular polyethylene glycol mono and diesters of fatty acids, polyacrylates (for example, Carbopole® of Goodrich or Synthalene® of Sigma), polyacrylamides, polyvinyl alcohol, and polyvinyl pyrrolidone, tensides such as, for example, ethoxylated fatty acid glycerides, ester of fatty acids with polyols such as, for example, pentaerythrite or trimethylol propane, fatty alcohol ethoxylates with condensed homologous distribution or alkyl oligoglucosides as well as electrolytes such as cooking salt and ammonium chloride.

Low cationic polymers are, for example, cationic cellulose derivatives such as, for example, a quaternary hydroxy ethyl cellulose, which can be obtained under the designation of Polymer JR 400® of Amerchol, cationic starch, copolymers of diallyl



ammonium salts, and acrylamides, quaternary vinyl pyrrolidone/vinyl imidazol polymers such as, for example, Luviquar® (BASF), condensation products of polyglycols and amines, quaternary collagen polypeptides such as, for example, lauryl diammonium hydroxypropyl hydrolyzed collagen (Lamequar® L/Gruenau), quaternary wheat polypeptides, polyethylene imine, cationic silicon polymers such as, for example, amidomethicones, copolymers of adipic acid and dimethyl aminohydroxy propyl diethylene triamine (Cartararine®/Sandoz), copolymers of acrylic acid with dimethyl diallyl ammonium chloride (Merquat®550/Chemviron, polyaminopolyamides such as, for example, those described in the French patent publication 225,284, as well as their crosslinked water-soluble polymers, cationic chitin derivatives such as, for example, quaternary chitosan, if necessary microcrystalline distributed, condensation of dihalogen alkylene such as, for example, dibromobutane with bisdialkyl amines such as, for example, bis-dimethyl amine-1,3-propane, cationic guar-gum such as, for example, Jaguar® CBS, Jaguar® C-17, Jaguar® C-16 of the Celanese company, quaternary ammonium salt polymers such as, for example, Mirapol® A-15, Mirapol® AD-1, Mirapol® AZ-1 of the Mirapol company.

Suitable silicon compounds are, for example, dimethyl polysiloxanes, methylphenyl polysiloxanes, cyclic silicones, as well as amino, fatty acid, alcohol, polyether, epoxy, fluoro,

glycoside, and/or alkyl-modified silicon compounds, which can be fluid as well as also resinous at room temperature. Typical examples of fats are glycerides; as waxes are taken into consideration among others beeswax, carnauba wax, candelilla wax, montan wax, paraffin wax, or microwaxes, if necessary in combination with hydrophilic waxes, for example, cetylstearyl alcohol or partial glycerides. As stabilizers can be used metallic salts of fatty acids such as, for example, magnesium, aluminum, and/or zinc stearate. The commonly used film builders are, for example, chitosan, microcrystalline chitosan, quaternary chitosan, polyvinyl pyrrolidone, vinyl pyrrolidone-vinyl acetate copolymerizates, polymers of the acrylic acid series, quaternary cellulose derivatives, collagen, Hyaluronic acid or their salts and similar compounds. As sources for aqueous phases can serve montmorillonite, clay minerals, permulene, as well as alkyl-modified carbopol types (Goodrich).

Under UV-light filters are understood organic substances, which are able to absorb ultraviolet rays and which again emit the absorbed energy in long-wave form, for example, to emit again heat. The UV-B filters can be soluble in oil or water. As oil-soluble substances should be named, for example:

- 3-benzylidene camphora and their derivatives, for example, 3-(4-methyl benzylidene)-camphor;

- 4-aminobenzoic acid derivatives, preferably 4-(dimethylamino)-benzoic acid-2-ethylhexylester, 4-(dimethylamino)-benzoic acid-2-octylester, and 4-(dimethylamino)-benzoic acid amylester;
- esters of cinnamic acid-2-ethylhexyl ester (octocrylene);
- esters of salicylic acid, preferably salicylic acid-2-ethylhexyl ester, salicylic acid-4-isopropyl benzyl ester, salicylic acid homomethyl ester;
- derivatives of benzophenone, preferably 2-hydroxy-4-methoxy benzophenone, 2-hydroxy-4-methoxy-4'-methyl benzophenone, 2,2'-dihydroxy-4-methoxy benzophenone;
- esters of benzomalonic acid, preferably 4-methoxy benzomalonic acid di-2-ethyl hexylester;
- triazine derivatives such as, for example, 2,4,6-triamilo-(p-carbo-2'-ethyl-1'-hexyloxy)-1,3,5-triazine and octyl triazone;
- propane-1,3-diones such as, for example, 1-(4-tert. butyl phenyl)-3-4'-methoxy phenyl)-propane-1,3-dione.

As water soluble substances are considered:

- 2-phenyl benzimidazol-5-sulfonic acid and its alkali, earth alkali, ammonium, alkly ammonium, alkanol ammonium, and glucammonium salts;

- sulfonic acid derivatives of benzophenone, preferably 2-hydroxy-4-methoxy benzophenone-5-sulfonic acid and their salts;
- sulfonic acid derivatives of 3-benzylidene camphor such as, for example, 4-(2-oxo-3-bornylidene methyl)-benzyl sulfonic acid and 2-methyl-5-(2-oxo-3-bornylidene)-sulfonic acid and their salts.

As typical UV-A filter are considered especially derivatives of benzoyl methane such as, for example, 1-(4'-tert. butyl phenyl)-3-(4'-methoxy phenyl)propane-1,3-dione or 1-phenyl-3-(4'-isopropyl)propane-1,3-dione. The UV-A and UV-B filters can, of course, also be used in mixtures. Aside from the mentioned soluble substances, also insoluble pigments, namely finely dispersed metallic oxides or salts, can be considered such as, for example, titanium oxide, zinc oxide, iron oxide, aluminum oxide, cerium oxide, zirconium oxide, silicates (talc), barium sulfate and zinc stearate. The particles should have an average diameter of less than 100 nm, preferably between 5 and 50 nm, and particularly between 15 and 30 nm. They can have a spheric shape, but particles can also be used, which have an ellipsoid or another shape deviating in any way from the spheric shape. Aside the two previously-mentioned groups of primary light-protective products, also secondary light-protective products of the type of

the antioxidants, which interrupt the photochemical reaction chain, can be used,

/8

which are dissolved when the UV radiation penetrates the skin. Typical examples therefor are superoxide dismutase, tocopherols (vitamin E) and ascorbic acid (vitamin C). Other suitable UV-light protective filters can be seen in the overview by P. Finkel in the SOFW Journal 122,543 (1996).

To improve the flow behavior can also be used hydrotropes such as, for example, ethanol, isopropyl alcohol, or polyols. The polyols considered herein have preferably 2 to 15 carbon atoms and at least two hydroxyl groups. Typical examples are:

- glycerin;
- alkylene glycols such as, for example, ethylene glycol, diethylene glycol, propylene glycol, butylene glycol, hexylene glycol, as well as polyethylene glycols with an average molecular weight of 100 to 1,000 Dalton;
- technical oligoglycerin mixtures with an autocondensation degree of 1.5 to 10 such as technical diglycerin mixtures with a diglycerin content of 40 to 50 weight percent;
- methylol compounds such as especially trimethylol ethane, trimethylol propane, trimethylol butane, pentaerythrite, and dipentaerythrite;

- low alkyl glucosides, especially those with 1 to 8 carbon atoms in the alkyl residue such as, for example, methyl and butyl glucosides;
- sugar alcohols with 5 to 12 carbon atoms such as, for example, sorbit or mannit;
- sugars with 5 to 12 carbon atoms such as, for example, glucose or saccharose; and
- amino sugars such as, for example, glucamine.

As preservatives are suitable phenoxy ethanol formaldehyde solution, parabene, pentane diol or sorbic acid. As insect-repellents are considered N,N-diethyl-m-toluolamide, 1,2-pentane diol or insect repellent 3535, as self-tanning product is suitable dihydroxy acetone.

As perfumed oils are mentioned the extracts of flowers (lavender, roses, jasmine, neroli), stems and leaves (geranium, patchouli, petitgrain), fruits (anise, coriander, caraway seeds, juniper), fruit peels (tangerines, lemon, oranges), roots (Macis, Angelica, celeriac, cardamom, costus, iris, calmus), woods (sandalwood, guajak, cedar, rosewood), herbs and grasses (estragon, lemongrass, sage, thyme), needles and twigs (spruce, fir, pine, dwarf pine), resins and balms (galbanum, elemi, benzoc, myrrh, olibanum, opoponax). Also animal raw substances are considered such as, for example, musk, zibet, and castoreum. As synthetic or semisynthetic perfumed oils are taken into

consideration ambroxan, eugenol, isoeugenol, citronella, hydroxy citronella, geraniol, citronelliol, geranyl acetate, citral, ionone, and methyl ionone.

As dyes can be suitable substances used and allowed for cosmetic purposes such as, for example, those listed in the publication "Cosmetic Dyes" of the Commission on Dyes of the German Research Association, Chemie Publishers, Weinheim, 1984, p. 81-106. These dyes are usually used in concentrations of 0.001 to 0.1 weight percent with respect to the entire mixture.

The entire fraction of auxiliary substances and additives can amount from 1 to 50, preferably 5 to 40 weight percent with respect to the product. The production can take place by the usual cold or heat processes; the work is preferably carried out according to the phase temperature inversion method.

#### Examples

- Example 1, comparative example V1. Analyzed were the wet combability when using a hair treatment according to the invention with glycerin carbonate and a comparison mixture with silicon oil. The comparison shows that the recipe with glycerin carbonate is clearly more effective.
- Example 2, comparative example V2. In a recipe with and without glycerin carbonate was incorporated the anti-dandruff active ingredient climbazole under heating. The formulation 2 according to the invention was clear and also remained stable

during storage at 40°C for at least 4 weeks. The comparison recipe V2 was opaque and became unmixed within a few hours.

- Examples 3 to 5. The preparations according to the invention show exemplary formulations for hair treatments with glycerin carbonate as emulsifier.

The results are summarized in Table 1.



Table 1

Technical Application Results (quantities in weight percentages)

Composition/Performance	1	V1	2	V2	3	4	5
Sodium laureth sulfate	10.0	10.0	8.0	8.0	-	-	-
Coco glucosides	3.0	3.0	4.0	4.0	-	-	-
Cetrimonium chloride	-	-	-	-	1.0	-	-
Distearoylethyl hydroxyethymonium methosulfate (and) cetearyl alcohol	-	-	-	-	-	1.0	-
Coco esterquats	-	-	-	-	-	-	1.0
Ceteareth-20	-	-	-	-	0.5	0.5	0.5
Cetearyl alcohol	-	-	-	-	3.0	2.7	3.0
Glycerol carbonates	2.0	-	9.0	-	2.0	2.0	2.0
Dimethyl polysiloxanes	2.0	-	-	-	-	-	-
Climbazol	1.0	1.0	-	-	-	-	-
Sodium chloride	3.0	3.0	-	-	-	-	-
Water	ad 100						
% residue dry combability	74	59	-	-	-	-	-
Stability	-	-	stable	unstable	-	-	-

## Patent Claims

1. Use of glycerin carbonate as emulsifier for producing surfactant preparations.
2. Use according to claim 1, characterized in that glycerin carbonate is used together with anionic, non-ionic, cationic, amphoteric, and/or zwitterionic tensides.
3. Use according to claim 2, characterized in that glycerin carbonate is used together with alkylether sulfate and/or alkyl and/or alkenyl oligoglycosides.

4. Use according to at least one of the claims 1 to 3, characterized in that glycerin carbonate is used together with oily bodies, which are selected from the group which is formed by guerbet alcohols on a basis of fatty alcohols with 6 to 18, preferably 8 to 10 carbon atoms, esters of linear C<sub>6</sub>-C<sub>20</sub> fatty acids with linear C<sub>6</sub>-C<sub>20</sub> fatty alcohols, esters of branched C<sub>6</sub>-C<sub>13</sub> carbonic acids with linear C<sub>6</sub>-C<sub>20</sub> fatty alcohols, esters of linear C<sub>6</sub>-C<sub>18</sub> fatty acids with branched alcohols, esters of linear and/or branched fatty acids with polyvalent alcohols and/or guerbet alcohols with aromatic carbonic acids, dicarbonic acid esters, vegetable oils, branched primary alcohols, substituted cyclohexanes, dialkyl carbonates, guerbet carbonates, dialkyl ethers, ring opening products of epoxidized fatty acid esters with polyols, silicon oils and/or aliphatic or naphthenic hydrocarbons.

5. Use according to at least one of the claims 1 to 4, characterized in that glyceride carbonate is used together with co-emulsifiers, which are selected from the group which is formed by:

(a1) addition products of 2 to 30 mol ethylene oxide and/or 0 to 5 mol propylene oxide on linear fatty alcohols with 8 to 22 C atoms, on fatty acids with 12 to 22 C atoms, and on alkyl phenols with 8 to 15 C atoms in the alkyl group;

(a2) C<sub>12/18</sub> fatty acid mono and diesters of addition products of 1 to 30 mol ethylene oxide on glycerin;

(a3) glycerin mono and diesters and sorbitan mono and diesters of saturated and unsaturated fatty acids with 6 to 22 carbon atoms and their ethylene oxide addition products;

(a4) alkyl monoglycosides and oligoglycosides with 8 to 22 carbon atoms in the alkyl residue and their ethoxylated analogs;

(a5) addition products of 15 to 60 mol ethylene oxide on ricinus oil and/or hardened ricinus oil;

(a6) polyesters;

(a7) addition products of 2 to 15 mol ethylene oxide on ricinus oil and/or hardened ricinus oil;

(a8) Partial esters on a basis of linear, branched, unsaturated, or saturated C<sub>6/22</sub> fatty acids, ricinus acid as well as 12-hydroxystearic acid and glycerin, polyglycerin, pentaerythrite, dipentaerythrite, sugar alcohols, alkyl glucosides, as well as polyglucosides;

/10

(a9) trialkyl phosphates as well as mono, di, and/or tri-PEG alkyl phosphates;

(a10) wool wax alcohols;

(a11) polysiloxane polyalkyl polyether copolymers or corresponding derivatives;

(a12) mixed ethers of pentaerythrite, fatty acids, citric acid, and fatty alcohol and/or mixed esters of fatty acids with 6 to 22 carbon atoms, methyl glucose, and polyolene, as well as

(a13) polyalkylene glycols.

6. Use according to at least one of the claims 1 to 5, characterized in that glycerin carbonate is used together with active ingredients.

7. Use according to at least one of the claims 1 to 6, characterized in that glycerin carbonate is used together brightening waxes, which are selected from the group formed by;

(b1) alkylene glycol esters;

(b2) fatty acid alkanolamides;

(b3) partial glycerides;

(b4) esters of polyvalent, if necessary hydroxy-substituted, carbonic acids with fatty alcohols with 6 to 22 carbon atoms;

(b5) fatty alcohols, fatty ketones, fatty aldehydes, fatty ethers, and/or fatty carbonates, which in sum have at least 24 carbon atoms;

(b6) fatty acids and hydroxy fatty acids with 16 to 22 carbon atoms; as well as

(b7) ring opening products of olefin epoxides with 12 to 22 carbon atoms with fatty alcohols with 12 to 22 carbon atoms

and/or polyols with 2 to 15 carbon atoms and 2 to 10 hydroxyl groups.

8. Use of glycerin carbonate as substitute for silicon oxides in cosmetic and/or pharmaceutical preparations.

9. Use of glycerin carbonate as enhancing product for producing cosmetic preparations.